

# Health

## AN ECOSYSTEM APPROACH

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### Preventing Pesticide Poisonings in Ecuador

Integrated pest management yields economic and health benefits

*Potato farmers in the province of Carchi in northern Ecuador suffer a number of health problems caused by high exposure to chemical insecticides. With funding from Canada's International Development Research Centre (IDRC) and other donors, researchers and communities have found ways of reducing pesticide use and farm families' exposure, without reducing yields.*



IDRC: Donald Cole

Highly toxic chemicals and few safety precautions led to a high rate of pesticide poisoning among potato farmers in Carchi.

In a country where the national diet centres on the potato, the Ecuadorian province of Carchi plays an especially important role. Located in the cool northern highlands of the Andes, the province accounts for 40 percent of Ecuador's potato production, while occupying only 25 percent of its area. Carchi's productivity can partly be explained by the richness of the region's black mountain soil. But many local farmers also believe their high yields — which are well above the national average — would not be possible without the liberal application of chemical pesticides.

For the 8 000 or so commercial farmers of Carchi, pesticides have been both a blessing and a curse. Introduced in the late 1940s along with chemical fertilizers, synthetic pesticides enabled farmers to control a number of pernicious pests, such as the tuber-boring larva of the Andean weevil and a variety of foliage-damaging insects. Factory-made fungicides are also used to control blight. These chemical adjuncts have played a central role in the story of Carchi's economic growth, being responsible for the initial surge in productivity that allowed local producers to switch from subsistence agriculture to commercial production, effectively boosting farm families' incomes. Naturally, farmers today are reluctant to abandon the products upon which their livelihoods appear to be built.

Still, any economic benefits arising from pesticide use have come at a high human cost. The rate of pesticide poisoning in Carchi is among the highest recorded anywhere in the world. Among the rural population, the annual number of deaths resulting from pesticide exposure is 4 per every 10 000 citizens, with the number of nonlethal poisonings observed in a clinical setting also standing at 4 per 10 000. Questionnaire data, meanwhile, reveals that 4 out of every 100 rural people suffer pesticide poisonings that are not reported to the medical authorities.

## Poison in the fields

Dr Donald Cole, senior scientist at the Toronto-based Institute for Work and Health and associate professor at the University of Toronto's Faculty of Medicine, has observed the conditions that underlie these chilling statistics. He has worked with colleagues in Carchi since 1990. That's when he first beheld small landholders out in their fields, spraying a cocktail of chemicals stored in flimsy backpacks. "You could see that the pesticides would leak out of the backpacks and run down their backs and legs," he recalls. At the same time, pesticides that were purchased in powder form had to be mixed at home — putting all members of the family at risk.

The dangers to both workers and their families are heightened by the fact that the most commonplace pesticides used in Ecuador are also among the world's most dangerous. Carbofuran (used to control the Andean weevil) and methamidophos (used to combat foliage pests) account for 47 percent and 43 percent, respectively, of all active insecticide ingredients applied in Carchi. Both of those chemicals are classified as highly toxic by the World Health Organization and are restricted in Northern countries because of their acute toxicity and ease of absorption. Exposure to pesticides such as these is associated with genetic and reproductive disorders and cancers, dermatitis and other skin problems, as well as neurological disorders. In the Carchi case, scientists have also speculated that the high rate of suicide may be related to the mood-altering effects of pesticide exposure.

Yet farmers continued to spray these pesticides, says Dr Cole, because they realized that "the most toxic pesticides are also the cheapest." Agrochemical companies, he adds, vigorously promote products that are severely restricted in the North because "they are now beyond patent protection, so they are cheap to get and provide a pretty good profit."

## Grassroots commitment to change

So the researchers faced "some real push backs by agrochemical companies" determined to protect their markets, recalls Dr Cole. They also ran up against the reluctance of the farmers themselves, who were persuaded to keep spraying pesticides by powerful economic logic: while these chemicals may be bad for human health, they are also cheap and lead to more plentiful crops. Those financial considerations were especially important at a time when falling prices had plunged the nation's potato industry into crisis.

All of which underscores the need to address not just the scientific aspects of the problem but also its economic and social dimensions — and for farm families to feel directly connected to the goals of the research project. The most sensible and scientifically sound research would be of no practical use unless the people who work the land in Carchi believed it would improve their lives. That's why the IDRC-supported project was designed in a "transdisciplinary" manner that



IDRC: Donald Cole

Pesticide residues on clothing and people travel from the fields to farmers' homes, putting the entire family at risk.

combined conventional research-gathering methods with a strong participatory research approach.

Dr Cole began work on the project in 1998, joining project leader Dr Charles Crissman and his team from the International Potato Center (CIP), along with colleagues from a number of national and international organizations, including the Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP) of Ecuador, the Programme for Appropriate Technology in Health (PATH Canada), McMaster University, and Wageningen Agriculture University of the Netherlands. The project received material support from IDRC, CIP, INIAP, PATH Canada, and the University of Montana in the USA.

With the goal of reducing pesticide dependence and its health effects, the project combined the skills of field staff from several different professional cultures (such as agricultural extension, participatory research, feminist social change, and health services). Those cultures all operate from different perspectives and employ different methods. Sometimes these approaches came into conflict, but more often they proved to be complimentary — offering insight into the pesticide problem from perspectives the project leaders defined as "economic" (concerned with productivity and its financial results), "instrumental" (focusing on hard science and statistical data), and "interactive" (which stressed the role of community members themselves in finding solutions).

## The diagnosis and solutions

Setting up operations in three communities (La Libertad, Santa Martha de Cuba, and San Pedro de Piartal), the project team embarked on an ambitious program that included both research gathering and active intervention. In the first stage, researchers sought to quantify the effects of pesticide exposure, first by surveying the health and nutritional status of the affected population and then by conducting a battery of neurological tests. Following that, workers directly confronted



the harmful effects of pesticides by promoting integrated pest management (IPM) techniques and the use of protective gear when spraying crops. The project also aimed to influence pesticide policy through participation in various conferences and forums at the provincial, federal, and international levels.

The project followed the principles espoused by participatory research: for example, that research subjects should be self-presenting. In this case, they were families who voluntarily showed up at agricultural field schools where courses were being offered. Yet when families dropped out — threatening to skew final research results — the project had the flexibility to adopt “nonparticipatory” research techniques by seeking out those families and conducting more conventional, unidirectional interviews.

Dr Cole believes that the participatory nature of the project fostered a real sense of engagement in the three communities where the research and education took place — despite other pressing concerns competing for community members’ attention. “Farm people are busy people,” he says. “They always have lots to do, and there are lots of well-meaning non-governmental organizations trying to do all sorts of projects with them. But at the same time, something to help crop production and improve health, particularly the health of children, they would deem that to be very important.”

Dr Cole recalls, for instance, the fascination of participants when project workers used phosphorescent dye to illustrate how pesticide residues can travel between people and through homes, where sanitary conditions are less than adequate. “When we showed them the routes of exposure — you try to wash the stuff off and it’s still all over you, and it gets on the kids’ boots and hands and faces — that really struck home,” he remembers.

Another strength of the transdisciplinary approach was that it incorporated gender issues into the consideration of pesticide poisoning. This is particularly important in a culture where attitudes about the use and safety of chemicals are inter-

twined with ideas about male and female characteristics.

The late Verónica Mera-Orcés, an Ecuadorian researcher who contributed to the project, noted that “Pesticide-related sicknesses are associated with weakness. There is the concept that a real man has to be strong and pesticides cannot affect a strong man.”

The research, however, showed that men and women are equally vulnerable to pesticide poisoning, although men are more likely to be exposed in the fields, while women and children more often come into contact with pesticides in the home. The project thus blazed new trails for women as leaders, with women associated with an agricultural project working for the first time in the communities. In addition, project activities focused on the economic contributions and workday routines of both men and women.

## Shifting cultures

The central effect of the project, however, is that attitudes about pesticides — and practices in the field — have shifted. This has come about largely because the participants at the farmer field schools were able to demonstrate that reducing dependence on pesticides produces a win-win outcome, with a clear economic benefits as well as a positive impact on health.

At the field school, farmers experimented with a variety of integrated pest management techniques, such as the introduction of weevil traps, the adoption of different strains of blight-resistant potatoes, the use of more specific applications of lower toxicity pesticides, and prespray monitoring of fields. The effects of this approach were striking. The number of pesticides applications was reduced from 12 (in convention plots) to 7 (in plots that used IPM techniques). More tellingly, the overall amount of pesticides applied dropped dramatically. The amount of active ingredient used as fungicide for light blight decreased by 50 percent, while the quantities of insecticide used for Andean weevil and leafminer declined by 75 percent and 40 percent, respectively. The subsidiary economic effects of this are significant. The IPM fields yielded as many or more potatoes than conventional plots, but production costs decreased from US\$104 per tonne for conventional plots to \$80 for IPM plots.

Dr Cole believes there are two factors behind this improved economic picture. One is the enhanced level of skill and expanded repertoire of farming techniques that participants acquired at the field school. The other factor is that farmers who used less pesticides suffered fewer neurological effects, which led the team to conclude that mental capacity is one determinant of how effectively farmers can work the land. The research showed a link between the neurological condition of the farmers and their productivity.

While pesticides have not been eliminated from these three Carchi communities, they are now generally used more



IDRC: Donald Cole

Research showed that farmers who used less pesticides suffered fewer neurological effects and were more productive.

cautiously. There is also momentum at a policy level for reducing pesticide dependence. For instance, 105 province-wide stakeholders — representatives from government, industry, development organizations, communities, and the media — were brought together in October 1999 for a meeting on pesticides and health. One outcome of the meeting was a declaration that demanded, among other things, the prohibition of highly toxic products, the inclusion of IPM in university-level agricultural training, and wider dissemination of information on the effects of pesticides.

International involvement in the pesticide issue has also risen. Following the success of the project, the Food and Agriculture Organization of the United Nations provided major funding to extend across four Ecuadorian provinces (including Carchi) the IPM training methods introduced by the project team.

The project's nurse, meanwhile, has been hired by an agro-chemical company to conduct health and safety training — informing farmers about what precautions to take while spraying — and has compiled a comprehensive information package that feeds the knowledge gained by the project back to the communities.

At ground level, one of the major accomplishments has been the reduction in the pesticide poisonings. Dr Cole also notes a change of culture in the participating communities. "Things have changed somewhat," he says. "People are more aware,



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Participants at farmer field schools learned integrated pest management techniques, including more targeted use of less toxic pesticides.

and particularly there is more of a debate between men and women in the communities — women wanting the men to take more care, and the men realizing that they should take more care. Many more of them would have personal protective gear and would use it. A fair number of them would be using integrated pest management approaches and trying to use less of the toxic compounds."

This *Case Study* was written by Stephen Dale on behalf of IDRC's Communications Division.

[www.idrc.ca/ecohealth](http://www.idrc.ca/ecohealth)

## For more information:

**Charles Crissman**

International Potato Center  
PO Box 25171  
Nairobi, Kenya

Tel.: (254 2) 630 743 ext. 4937

Fax: (254 2) 630 005

Email: [crissman@cip.org.ec](mailto:crissman@cip.org.ec)  
[c.crissman@cgiar.org](mailto:c.crissman@cgiar.org)

## Ecosystem Approaches to Human Health

Human health and well-being are intimately tied to the health of the ecosystems that sustain life. Yet the potential for improving health by better managing the local environment is an avenue rarely explored in mainstream health programming. Through its Ecosystem Approaches to Human Health (Ecohealth) Program Initiative, IDRC aims to identify the web of economic, social, and environmental factors that influence human health. Communities can then use this knowledge to better manage ecosystems and improve the health of both people and the ecosystem.

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Ecosystem Approaches  
to Human Health Program Initiative  
International Development  
Research Centre  
PO Box 8500, Ottawa, ON  
Canada K1G 3H9

Tel.: +1 (613) 236-6163

Fax: +1 (613) 567-7748

Email: [ecohealth@idrc.ca](mailto:ecohealth@idrc.ca)

Web: [www.idrc.ca/ecohealth](http://www.idrc.ca/ecohealth)

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